Mid Snake River/Succor Creek Watershed

TMDL Implementation Plan for Agriculture

June 2005

IDAHO SOIL CONSERVATION COMMISSION

IASCD

CONSERVATION DEVELOPMENT SELF GOVERNMENT

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Preface

The Mid Snake Succor Creek Watershed TMDL Implementation Plan was drafted by land management agencies that affect water quality in this area. The Idaho Association of Soil Conservation Districts (IASCD) represents private landowners and wrote the majority of the plan. The Bureau of Land Management (BLM) is the largest landowner in the area. The Department of Lands (IDL) manages State-owned land.

Tracking Accomplishments
The Department of Environmental Quality will track annually the accomplishments that Land Management Agencies have had to achieve Water Quality Standards. The DEQ, BLM, IDL, and IASCD agree to meet each year to document what projects occurred over the previous field season. Projects will be compared with the Tasks and Milestones that are outlined in respective portions of the implementation plan.

INTRODUCTION

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States and tribes, pursuant to section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the Mid Snake River/Succor Creek Subbasin that have been placed on what is known as the "§303(d) list."

The Mid Snake River/Succor Creek Watershed Advisory Group (WAG) and the designated agencies played a significant role in the TMDL development process. The WAG and the designated agencies were involved in developing the allocation processes and their continued participation will be critical while implementing the TMDL.

Purpose

The purpose of this TMDL Implementation Plan for Agriculture is to provide a prioritization strategy for implementing conservation improvements on privately owned lands. The intent is to help restore designated beneficial uses on the 303(d) listed streams within the Mid Snake River/Succor Creek Watershed by reducing pollutant contributions from privately owned parcels of land. The costs to install Best Management Practices (BMPs) on private agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting specific TMDL goals. Availability of cost-share funds to agricultural producers within the Mid Snake River/Succor Creek Watershed will likely be necessary to meet the TMDL requirements within each stream segment that received a load reduction target.

Goals and Objectives

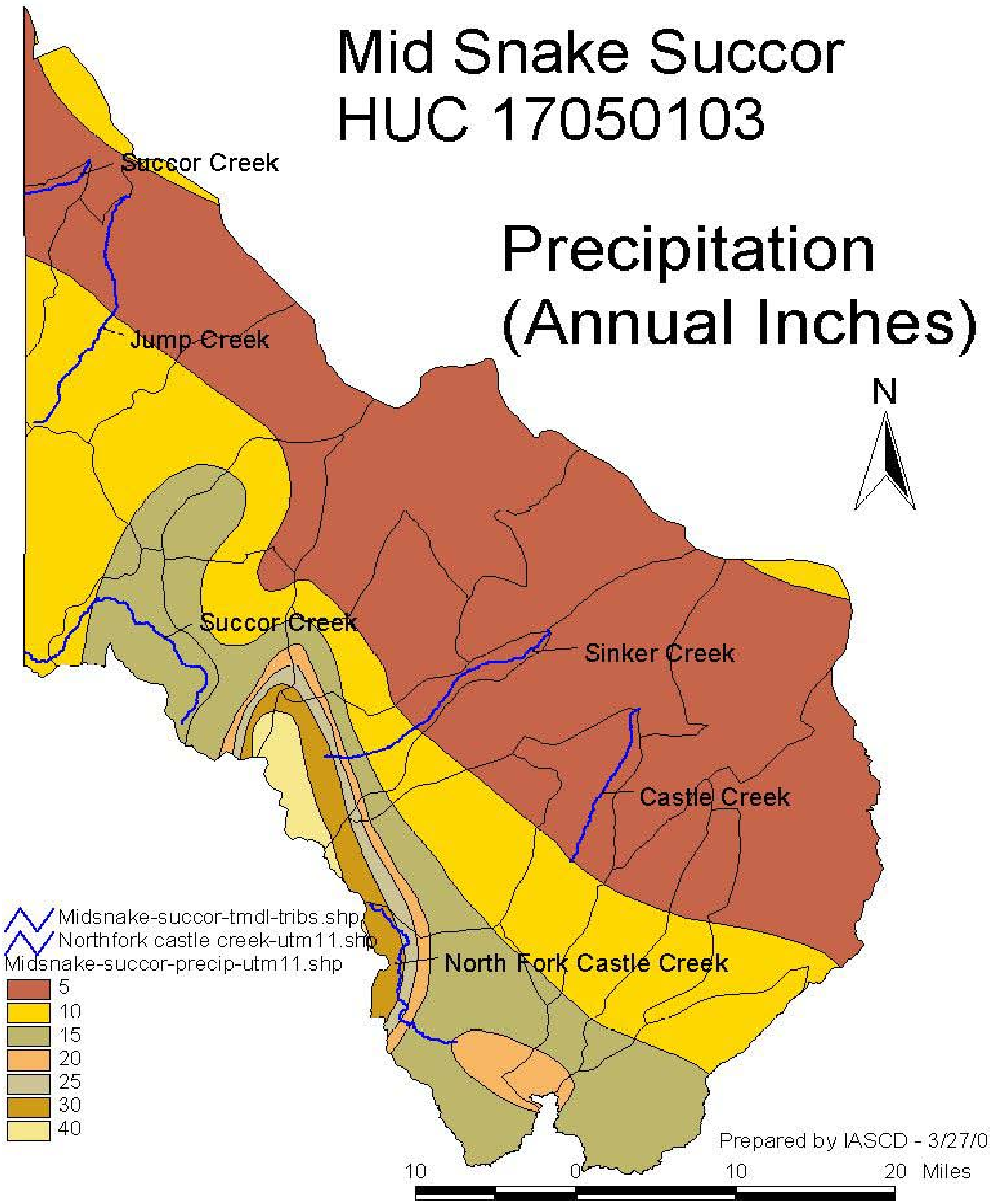
The goal of this plan is to assist and/or compliment other watershed efforts to restore beneficial uses for the 303(d) listed stream segments within the Mid Snake River/Succor Creek Watershed. The agricultural component of the Mid Snake River/Succor Creek Watershed TMDL Implementation Plan includes an adaptive management approach for the implementation of Resource Management Systems (RMSs) and Best Management Practices (BMPs) to meet the requirements for the Mid Snake River/Succor Creek TMDL. The primary objectives of this plan are to reduce the amount of nutrients entering the Mid Snake River system and, where feasible, to decrease stream temperatures by increasing shading along stream corridors. Agricultural RMSs and BMPs on privately owned land will be developed and implemented on site with individual agricultural operators as per the 2003 Idaho Agricultural Pollution Abatement Plan (APAP).

The State of Idaho has adopted a non-regulatory approach to control agricultural non-point sources. However, regulatory authority can be found in the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02.350.01 through 58.01.02.350.03), which provides direction to the agricultural community and includes a list of approved BMPs. A portion of the APAP outlines responsible agencies or elected groups designated to address non-point source pollution problems. For agricultural activities on private land, the Owyhee Soil Conservation District and the Bruneau River Soil Conservation District (BRSCD) in cooperation with the Idaho Soil Conservation Commission (ISCC), the Idaho Association of Soil Conservation Districts (IASCD), and the Natural Resource Conservation Service (NRCS) can assist landowners in developing and implementing conservation plans that incorporate BMPs that will help meet TMDL allocation targets.

BACKGROUND

Project Setting

The Mid Snake River/Succor Creek watershed is a semi- arid watershed characterized by hot summer temperatures. There are a total of 373 different soil types identified and recorded in the NRCS Soil Survey of Owyhee County. This survey took the NRCS over 25 years to complete due to the rugged terrain and remoteness of the region. Tributaries in this watershed are generally low volume rangeland streams that have a combination of high ambient temperatures, rocky geography, poor shading, low flow volume, flow alteration, and naturally warm springs, which often lead to exceeding of the water temperature standards. Even with maximum potential shade, some of the streams in the watershed cannot meet the cold water temperature standard. These streams were evaluated to determine the best achievable temperature based on the maximum potential shade.



The Owyhee's "A Land of Change"

Dramatic climatic changes have occurred in the Owyhee Mountains in the last one hundred to one hundred and fifty years. The exact date of this climatic transition varies slightly depending on the source, but scientists generally agree that it occurred around the 1860's (Great Basin Riparian Ecosystems 2004). The area began to slowly change over time from a high precipitation tall grass area to a low precipitation desert plant community. When the first settlers began to move into the Owyhee Mountains in the 1860's and 1870's, they recorded grasses to their horse's shoulders. Other settlers' journals recorded looking over a sea of tall grass as far as the eye could see, taller than their wagon wheels.

As you review settlers' accounts around 1900, they began telling of drier and drier conditions occurring in the Owyhee Mountains and surrounding area. Heavy snow years did not happen every year, but only one year out of five. The annual precipitation was diminishing and the tall grasses had all but disappeared. The early settlers used the Owyhees to raise horses and sheep. They sold replacement horses to the Army and raised small bands of sheep for wool and meat. Sheep and horses were the primary livestock raised in the Owyhees until the early 1940's.

According to the Black's family journal and Paul Black born in 1908, the Indian bands would use the Antelope Trail and the Desert Trail out of the high country of the Owyhee Mountains and the Lonesome Trail between Shoo Fly Creek and Little Jacks Creek in late spring and early summer each year to make their way to the annual encampment at the mouth of the Bruneau River. They would go to the Bruneau encampment to catch and dry their winter supply of salmon. The Indian Trails were used so heavily for so many years that they were beat deep into the earth and can still be seen to this day. There was an abundance of trout in the streams in the Upper Owyhee country during the late 1800's.

According to the Black family and other early settlers, the earthquake in October of 1915 changed the Upper Owyhee country forever. For months after the earthquake, the springs and streams ran murky water and the stream and spring flows dropped off sharply. Many springs dried up, and water had to be hauled in for livestock in areas that always had water previously. As stream and spring flows continued to decrease in the 1920s, many homesteads had to be abandoned. Meadows in Camas Creek, Battle Creek, Big Springs, and Rock Creek no longer produced enough hay for the winter feeding of horses and the settlers were forced to move. Where there were large trout populations, they disappeared. Paul Black remembered how they would catch gunny sacks of trout in Battle Creek; and attributes that to the loss of water flow after the 1915 earthquake. Today, there are only limited populations of trout caught in short sections of streams that have enough water year around in the Owyhee Subbasin. There were lawsuits filed over water rights after the earthquake as the

water supply dwindled. One of the latest lawsuits was Burkhardt vs. Black (1981) involving water rights on Shoo Fly Creek.
Figure 1.1 shows the §303(d) listed water bodies within the basin and the Mid Snake River/Succor Creek watershed boundaries.

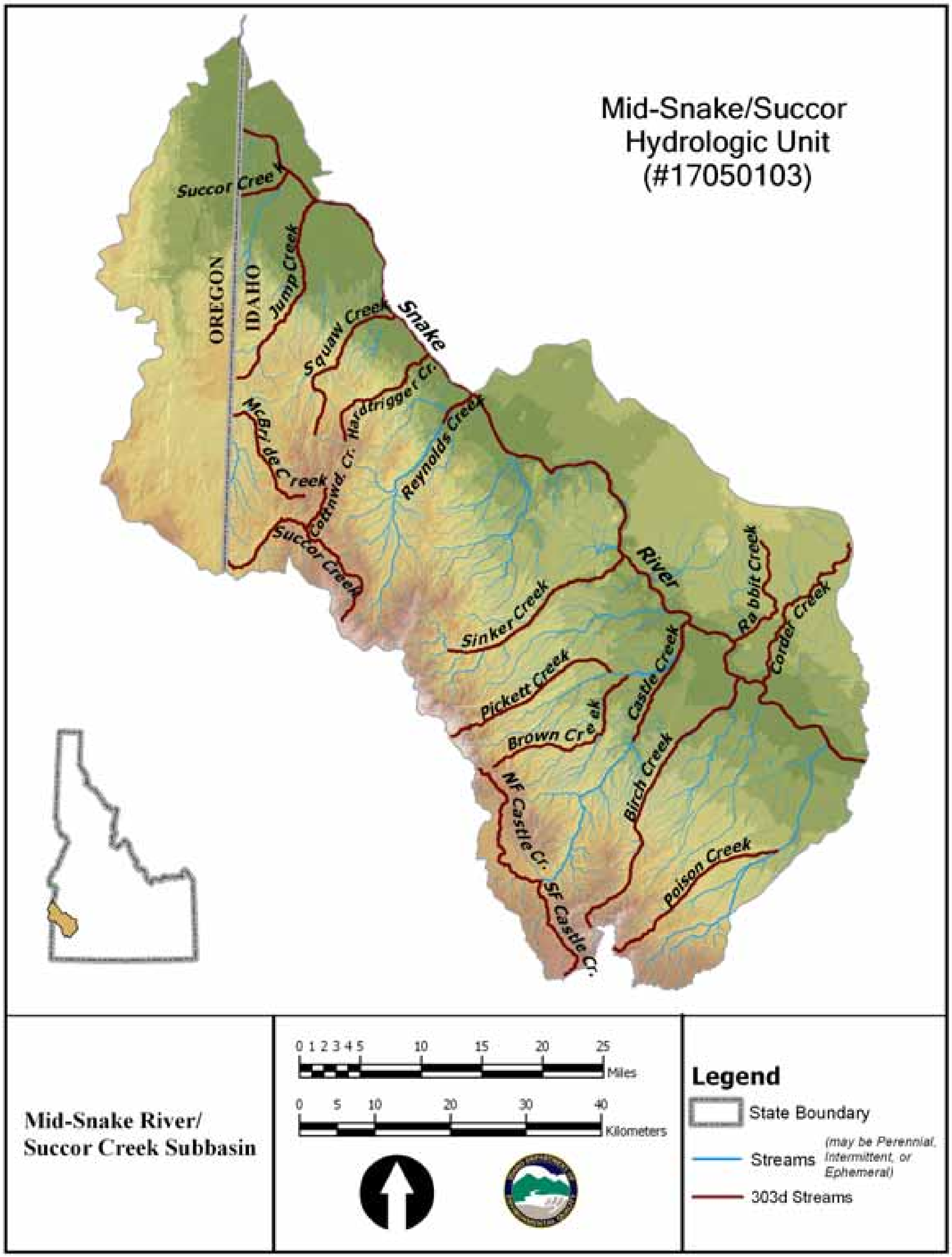


Figure 1.1 Mid-Snake River/Succor Creek Subbasin

WATERSHED CONCERNS

Pollutants: Load Allocations and Reductions

Nutrient loading to the Snake River comes from the upstream segment of the Snake River, drains, tributaries, and point sources. The primary nutrient impairing beneficial uses is phosphorus. A total phosphorus target of 0.07 mg/L has been set for the Mid Snake River, based upon the work done in the draft Snake River Hells Canyon (SR-HC) TMDL (DEQ 2001). The critical period for target application is May-September.

Instream channel erosion is the primary source of sediment loading in Castle Creek, Sinker Creek, and Succor Creek. Land management practices contribute to unstable banks and this resultant instability leads to sediment delivery to the stream channel. Eighty-percent bank stability was selected as a surrogate target to achieve 28% depth fines in the creek.

Table 1 below is the summary of specific stream segments for which TMDLs were set.

Table 1. Streams and pollutants for which TMDLs[1] were developed.

Stream	Pollutants
Snake River (Swan Falls to Oregon Line)	Nutrients, Dissolved Oxygen (as part of nutrient TMDL)
Castle Creek	Sediment
Jump Creek (Mule Creek to Snake River)	Sediment
Sinker Creek	Sediment, Temperature
Succor Creek (Headwaters to Oregon line)	Sediment, Temperature
Succor Creek (Oregon line to Snake River)	Sediment, Bacteria

[1]Total Maximum Daily Loads

Land Ownership & Land Use

The majority of the land within the Mid Snake River/Succor Creek Watershed consists of public lands that are owned and managed by the Bureau of Land Management (BLM) and Idaho Department of Lands (IDL). The primary use on these public lands is livestock grazing. The privately owned lands within the watershed are used primarily for livestock grazing in the mountain areas and farming along lower elevations of the tributary streams and the Snake River. Table 2 below shows the land ownership in the Mid Snake/ Succor Creek Watershed. Farming production is quite diversified in the lower elevations along the Snake River and its' tributaries. Crops commonly raised in these areas are alfalfa hay, silage corn, corn, grains (mostly wheat, oats and barley), mint, sugar beets, potatoes (bakers & processing), beans, peas, seed crops (alfalfa, clover, lettuce, radish, sweet corn, seed beans, popcorn, carrot, onion, sugar beet, a large variety of flower seeds, etc.), onions (yellow globe, whites, reds), irrigated pastures, and a variety of specialty crops. Irrigation systems vary as much as the different crops. Surface irrigation is used on about half of the acreage, while sprinkler accounts for the other half. There is also a limited amount of drip irrigation used on a few fields of onions in the area.
The different types of surface irrigation include mostly siphon tubes, gated pipe and check blocks. The different types of sprinkler irrigation include mostly pivots, wheel lines and solid sets. Drip tape is the most common type of drip irrigation used for onion production.

Table 2 : Land Ownership

Owner	Acres	Percent
B.L.M.	696,744	71.9%
Open water	3,264	0 .3%
Private	217,229	22.4%
State of Idaho	51,586	5.4%
Total	968,823	100.0%

Figure 1.2 that follows shows the actual distribution of the land ownership in the Mid Snake River / Succor Creek Watershed.

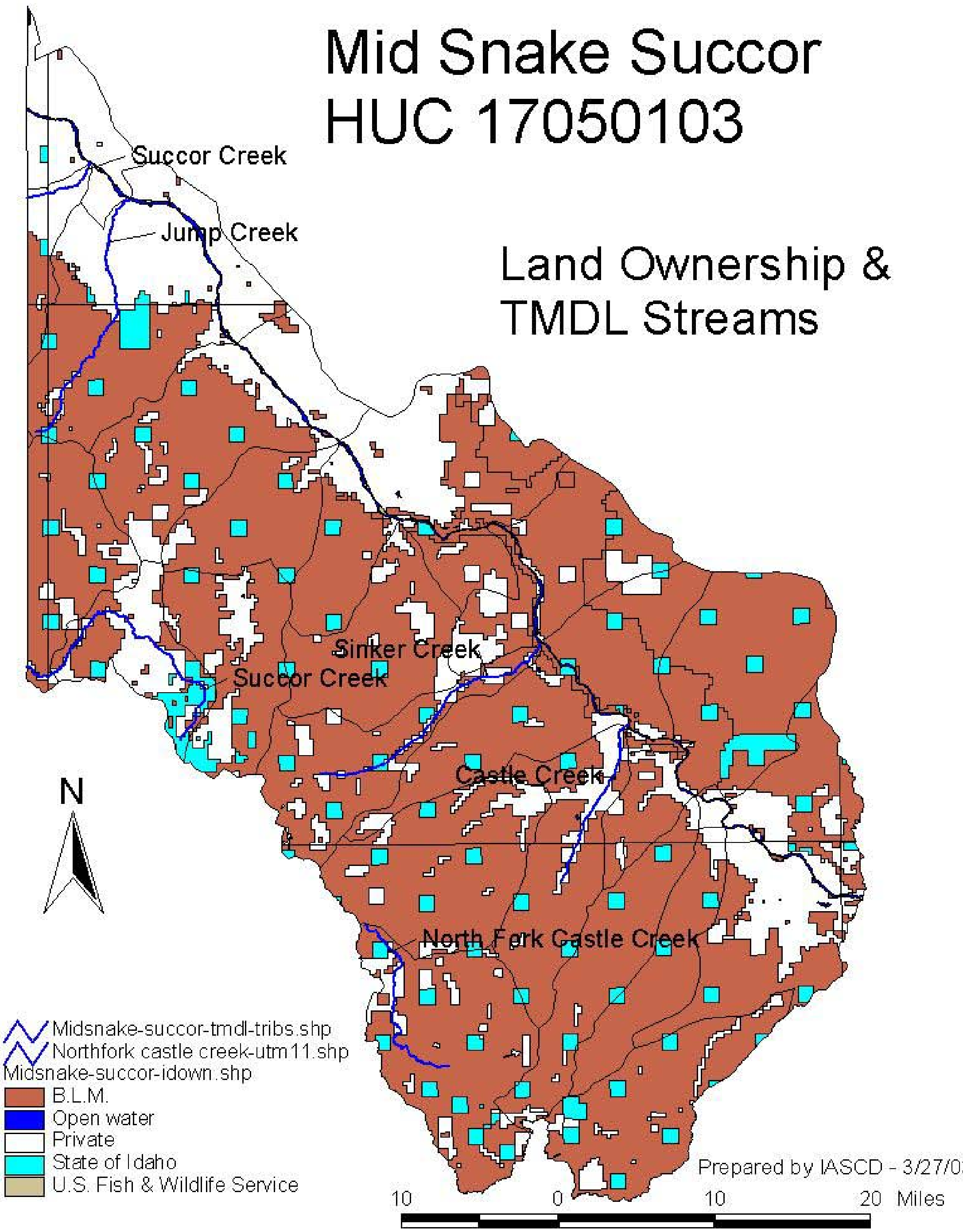


Figure 1.2 Land Ownership in the Mid Snake River/Succor Creek Watershed

ACCOMPLISHMENTS

Over the years since the early 1990's, many landowners and operators in the Mid Snake/Succor Creek Watershed have proactively installed many Best Management Practices (BMPs) on their own and in cooperation with the Bruneau River and Owyhee Soil Conservation Districts, as well as IDEQ and the NRCS. Based on field observations by ISCC and IASCD staff, the BMPs that have already been installed and BMPs that are presently being installed have greatly improved water quality within the watershed. With the producers, the Soil Conservation Districts, State and Federal agencies working together, we will be able to meet water quality standards within the Mid Snake/Succor Creek Watershed.

Castle Creek Subwatershed Accomplishments

Table 3. Installed BMPs on Castle Creek

Producer/Project/Program	Practice	Units	Total
Producers	Riparian Fencing	26,400 Ft.	5 Miles
Producers	Off Site Watering	6 Watering troughs	6 Watering troughs
Producers	Filter Strips – bottom of irrigated fields	12,000 Ft.	10.7 Acres
Producers	Sprinkler Irrigation	22 Fields	300 Acres
Producers	Proper Grazing Mgmt. – Riparian	11 Producers	1200 Acres

Table 3 above outlines the BMPs that have been installed on Castle Creek to date. In addition 2.5 miles of Castle Creek including adjacent land totaling over 400 acres has been developed into a wildlife area by one landowner. Livestock grazing has been excluded from this area for over four years. Five other producers along Castle Creek have changed their grazing management practices in order to enhance the riparian plant community along most of the 13 miles of Castle Creek that is 303 (d) listed. Refer to Castle Creek Subwatershed Appendix 1 for more implementation information.

Jump Creek Subwatershed Accomplishments

Table 4. Installed BMPs on Jump Creek

Producer/Project/Program	Practice	Units	Total
Producers	Livestock Nutrient Management Plans	Dairy – 3 Livestock -5	8 Plans approved to date
Producers/EQIP(NRCS)			
Producers	Surface to Sprinkler Irrigation	156 Fields	4,296.2 Acres

Table 4 above outlines the BMPs that have been installed on Jump Creek to date. Irrigation return flow was cited as the reason for sediment loading in Jump Creek according to the 1994 report. The bacteria problem was attributed to livestock operations. With this information the Owyhee Soil Conservation with the aid of the NRCS, ISCC and the IASCD were able to start working on the water quality problems to try to bring Jump Creek within water quality standards. In 1994, the primary source of irrigation was surface (flood) irrigation. Through education and financial programs, much of this surface irrigated farm ground has been converted to sprinkler irrigation. The feedlots and irrigated pastures are now managed to keep bacteria counts in Jump Creek within water quality standards. The Owyhee Soil Conservation District was one of the first districts in the state to test and recommend PAM to be used to reduce soil erosion on surface irrigated row crop land. Due to BMPs installed in the Jump Creek Watershed between 1994 and 2003, bacteria is no longer a water quality issue. Also, as more and more fields are being converted to sprinkler irrigation each year along with several other BMPs being used on an ever increasing level, the sediment loading in Jump Creek has decreased significantly.

Sinker Creek Subwatershed Accomplishments

Table 5. Installed BMPs on Sinker Creek

Producer/Project/Program	Practice	Units	Total
Producers	Converting from flood to sprinkler irrigation	14 Fields	132.7 Acres
Producers/EQIP(NRCS)	Converting from Flood to sprinkler irrigation	4 Fields	236 Acres
Producers	Grazing Management System	3 Producers	3 Producers

Table 5 above outlines the BMPs that have been installed on Sinker Creek to date. The Edwards Ranch cropland in the past has been flood irrigated, but they are in the process of converting their fields to wheel line sprinkler irrigation and pivot irrigation with an EQIP contract in 2004 and 2005. The Edwards ranch also plans to install riparian fencing and hardened livestock crossings along their portion of Sinker Creek. There was quite an erosion problem in the past under the flood irrigation system due to soil type and slope. With the conversion from flood to sprinkler irrigation and the other improvements that are being installed next spring, the sediment problem in Sinker Creek will be greatly decreased.

Upper Succor Creek Subwatershed Accomplishments

Table 6. Installed BMPs on Upper Succor Creek

Producer/Project/Program	Practice	Units	Total
Producers	Using Proper Riparian Grazing Management	5	5 Producers
Producers	Watering Troughs	2	2 Watering Troughs

Table 6 outlines the BMPs that have been installed on Upper Succor Creek to date. Although only three of the Upper Succor Creek reaches are at Proper Functioning Condition, the majority of the reaches are improving riparian condition showing an upward trend. This indicates that the present grazing management practices are having a positive effect on riparian condition. These practices should be maintained in order to improve overall riparian health, while improving water quality.

Lower Succor Creek Subwatershed Accomplishments

Table 7. Installed BMPs on Lower Succor Creek

Producer/Project/Program	Practice	Units	Total
Producers/IDEQ – 319 Grant	Succor Creek Wetlands Project	One	1 Wetland Project
Producers/NRCS – EQIP Program	Converting from Surface to Sprinkler Irrigation	33 Fields	33 Fields 519.9 Acres
Producers	Surface Irrigated Pastures	52 Fields	424.6 Acres

Table 7 above outlines the BMPs that have been installed on Lower Succor Creek to date. The Owyhee Soil Conservation District in conjunction with NRCS, IASCD, ISCC and IDEQ has been very much aware of water quality problems along Lower Succor Creek. Lower Succor Creek is 303 (d) listed for sediment and bacteria in the Mid Snake/Succor Creek TMDL. The Homedale School District received a 319 Grant to develop a wetland area on their property along Succor Creek in 2002. The 319 Grant was extended to December 31st 2003 in order to allow the school district time to finish the Succor Creek Wetlands project. The wetlands project is functioning as intended and has nearly eliminated the sedimentation problem in one of the agricultural drains that drains into Lower Succor Creek. There have also been some grazing management changes along Lower Succor creek that are having a positive impact on water quality. Most of the cropland in this sub-watershed is still surface irrigated, due to the small size of the fields. Other BMPs to slow down soil erosion are being installed by the farmers along Lower Succor Creek with the help of the five agencies mentioned above.

TMDL ALLOCATIONS

Sediment Allocations

Tables 8 and 9 shows the sediment load allocations for Succor Creek and each tributary that is a major source of sediment in Jump Creek. The sources were identified at a 1:24,000 scale. The allocations are designed to meet the Total Suspended Solid goals of 22 mg/L (lower Succor Creek) and 65 mg/L (Jump Creek) in the full length of the streams, with checkpoints near end of each stream. Fixed load targets were selected because the management practices that affect sediment loading to the streams are not expected to change on a day-to-day basis. Thus, the management practices should be developed to meet the load goals, which meet the target even when very low flow conditions occur in the stream. No point sources discharge to Succor or Jump Creeks. Additionally, there is no reserve for growth built into the allocations. Any additional point sources discharging to Succor or Jump Creek would receive a wasteload allocation of zero.

As described in section 5.2 of the Mid Snake/Succor TMDL, the loading capacity for lower Succor Creek and Jump Creeks is based on maintaining the instream target at all locations in the stream. As such, the actual mass load capacity changes at any given location in the stream as flows increase (or decrease with diversions). In addition to the load allocations, Tables 4 and 5 show the load capacity for each stream at the final downstream compliance point. As shown in the tables, if the load allocations are met, the loading capacity will be met.

Table 8. Total suspended solids load allocations for Succor Creek.

Name	Typical Existing Load: 2001-2002 (tons/day)	Load Allocation (tons/day)	Percent Reduction from Existing Load
Succor Creek above Sage Creek	1.19	1.19	0%
Sage Creek	8.79	1.84	79%
Succor Creek at Homedale	Load Capacity: 3.03	Load achieved with reductions: 3.03	--

Table 9. Total suspended solids load allocations for Jump Creek.

Name	Typical Existing Load: 2001-2002 (tons/day)	Load Allocation (tons/day)	Percent Reduction from Existing Load
Mule Creek	10.67	2.13	80%
Field Scale near B-Line Canal	3.38	0.09	97%
B-Line Canal	1.19	0.88	26%
Kora Canal	5.08	0.35	93%
B-4 Lateral	0.41	0.18	57%
Hortsman Drain	15.83	8.22	48%
Jump Creek at Railroad Trestle	Load Capacity: 12.06	Load achieved with reductions: 11.25	--

The analysis of sediment inputs into lower Succor and Jump Creeks focuses on a critical condition from May through September, the standard irrigation season. It is within that season that the most significant loads of sediment are generated.

The analysis for lower Succor Creek shows that the irrigation season TSS load in Sage Creek must be reduced by 79% in order to maintain 22 mg/L throughout the stream. The mass balance analysis for Jump Creek shows that the irrigation season tributary TSS loads must be reduced anywhere between 26% and 97% in order to maintain 65 mg/L throughout the stream. 1993 data shows the mixed concentration of Sage Creek and lower Succor Creek with a 79% reduction in TSS load from Sage Creek. Table 9 show the mass balance for Jump Creek, which is based on an equal concentration allocation scenario for the 1993 data. Working with DEQ, the WAG concluded that an equal concentration allocation scenario is the most equitable for all sources in Jump Creek. One of the primary drivers for this decision is the fact that an equal concentration allocation scenario does not penalize those sources that have already implemented best management practices.

Tables 10 and 11 show that based on the LAs, the target concentrations, and hence the load capacities, are never exceeded in the stream. Since these years represent typical flow conditions in the basin, the LAs will be applied to all years. The loads are not particularly conservative, but are likely to occur relatively frequently in comparison to the most extreme conditions, and thus are a better basis for establishing load targets than the most extreme condition on record. Tables 4 and 5 display the current and typical existing loads (based on the years described above), and the LAs that represent reductions. The loads derived from this process ensure that the targets for suspended solids are met throughout the streams. Note that the mixed concentrations in Tables 10 and 11 do not exceed the respective targets for each stream.

Table 10. Mixed Concentration of Total Suspended Solids in lower Succor Creek, Based on Sage Creek Load Reduction

	Flow	TSS (mg/L)	Mixed Flow in Succor Creek	Mixed Conc. in Succor Creek	Load Allocation (tons/day)	Current Load	% Reduction
Succor Creek above Sage	20.00	22.00			1.19	1.19	0
Sage Creek	31.00	22.00	51.00	22.00	1.84	8.79	79
Succor near Homedale			51.00	22.00			

Table 11. Total Suspended Solids Mass Balance for Jump Creek, Based on Equal Concentration Allocations

	Flow	TSS (mg/L)	Mixed Flow in Jump Creek	Mixed Conc. in Jump Creek	Load Allocation (tons/day)	Current Load	% Reduction
Jump above Mule Creek	16.30	32.12					
Mule Creek	12.11	65	28.41	46.14	2.13	10.67	80
Field Scale near B-Line	0.50	65	28.91	46.46	0.09	3.38	97
B-Line Canal	5.00	65	33.91	49.20	0.88	1.19	26
Town Canal Withdrawal	-15.00	49	18.91	49.20			
Kora Canal	2.00	65	20.91	50.71	0.35	5.08	93
B-4 Lateral	1.00	65	21.91	51.36	0.18	0.41	57
Hortsman Drain	46.84	65	68.75	60.65	8.22	15.83	48
Jump at RR Trestle			68.75	60.65			

The remaining stream segments in the Mid Snake River/Succor Creek basin that are receiving sediment allocations are receiving them due to excess stream bank erosion. Table 12 shows the load allocations for these segments. The worksheets used to derive these load allocations are located in Appendix H of the TMDL. The current erosion rate is based on the bank geometry and lateral recession rate at each measured reach. The target erosion rate is based on the bank geometry of the measured reach and the lateral recession rate at the reference reach. The reference reach is an area that contains greater than 80% bank stability and less than 28% fine substrate material. The loading capacity is the total load that is present when banks are at least 80% stable. As such, the loading capacity and the load allocations are the same. Note that these are the overall decreases necessary in the stream, but only apply to areas where banks are less than 80% stable. The determination of the reference reach was based solely on the water quality surrogates (e.g. bank stability, percent fines) at the reference site. The determination did not evaluate the land management activities that are contributing to the water quality.

Table 12. Stream bank erosion load allocations for Sinker Creek, UpperSuccor Creek, and Castle Creek.

Water Body	Current Erosion Rate (tons/mile/year)	Target Erosion Rate (tons/mile/year)	Current Total Erosion (tons/year)	Target Total Erosion (tons/year) Load Allocations Loading Capacity	% Decrease
Sinker Creek	35.26	32.20	352.57	322	8.64
Succor Creek (Granite Creek to Chipmunk Meadows)	214.80	36.52	637.96	108.45	83.07
Succor Creek (Directly below reservoir to Oregon line)	173.87	39.67	768.49	175.36	77.18
Castle Creek	56.35	43.41	704.35	542.63	21

Shaded cells represent existing loads

Bacteria Allocations

Lower Succor Creek is the only stream in Mid Snake River/Succor Creek hydrologic unit that requires a bacteria TMDL. The target for bacteria in lower Succor Creek is based upon the state criteria for primary contact recreation, for which the stream is designated. The entire reach below the Oregon line will accommodate primary contact recreation, therefore the compliance points for bacteria loading are any given location in the stream. The primary contact recreation beneficial use has associated numeric criteria in *Idaho's Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02.251.)

Table 13 shows the primary contact recreation geometric mean LAs for the tributaries to Succor Creek. The state of Oregon's allocation is consistent with Idaho's and Oregon's criteria for primary contact recreation. Assuming the stream enters Idaho at 126/100 mL, there will be no dilution available to downstream sources. The short length of the segment means that new dilution does not become available along the length of the stream. Thus, the tributaries to Succor Creek must be able to meet a geometric mean of 126/100 mL where they enter the stream. When dilution becomes available in the stream, tributaries may be able to discharge at slightly higher than the criteria. However, until data are collected to determine this, all sources to Succor Creek must be able to meet a geometric mean of 126/100 mL where they enter the stream. There are no point sources discharging to lower Succor Creek. Additionally, there is no reserve for growth built into the allocations. Any additional point sources discharging to Succor would receive a wasteload allocation of zero.

Table 13. Bacteria load allocations for Succor Creek.

Name	Existing Condition (#/100mL geometric mean)	Primary Contact Recreation Load Allocations (#/100mL geometric mean) Loading Capacity	Percent Reduction from Existing Load
Succor Creek at Oregon Line	Unknown	126	Unknown
Coates Drain	Unknown	126	Unknown
Murphy Drain	Unknown	126	Unknown
Sage Creek	266	126	53%

The bacteria load allocations are intended to target the geometric mean criteria for *E. Coli.* Compliance with those criteria must be judged using an appropriate number of samples. Tributaries should discharge bacteria in quantities that do not exceed state criteria for bacteria assuming little likelihood for dilution and minimal die-off.

Nutrient Allocations

The allocation strategy used for the nutrient TMDL is “equal concentration,” meaning that all sources must discharge at a concentration of 0.07 mg/L TP or less where they enter the river. This allocation applies to the Snake River from Swan Falls Dam to the Oregon line. Seasonal variation and critical conditions were accounted for in this allocation and the target applies from May-September. The instream seasonal concentration at River Mile 449.3 (Murphy) is 0.071 mg/L. An allocation for the sections of the river from CJ Strike Reservoir to Castle Creek and from Castle Creek to Swan Falls Dam may be necessary in the future. However, at this time a further delineation of tributary sources and instream concentrations above Swan Falls is necessary to determine where these allocations might need to occur. In addition, the Snake River where it exits CJ Strike Dam must meet the 0.07 mg/L target.   Using 1999 and 2000 data, the Snake River, below CJ Strike Dam, discharges at 0.07 mg/L, meeting the target.

Table 14. Instream Total Phosphorus Average Concentrations

Location	May-September Average Concentration (mg/L)
Snake River below CJ Strike Dam	0.07
Snake River at river mile 449.3	0.071
Snake River at Marsing (river mile 425)	0.082
Snake River at Homedale (river mile 417)	0.087

The Mid Snake River/Succor Creek WAG felt that equal concentration was the most equitable allocation scenario because this method does not require any sources to discharge below the 0.07 mg/L target and it does not penalize those sources that have already implemented best management practices.

Table 15. Loads from nonpoint sources to the Snake River in the Mid Snake River/Succor Creek Subbasin.

Wasteload Type	Location	Load	Estimation Method
Total Phosphorus	Drain and Tributaries	381 kg/day	Direct Load Average

Table 16. Waste loads from point sources to the Snake River in the Mid Snake River/Succor Creek Subbasin.

Wasteload Type	Location	Current Load (kg/day)	Load Allocation (kg/day)	NPDES Permit Number
Total Phosphorus	Marsing WWTP	2 kg/day	4 kg/day	Permit # ID0021202
Total Phosphorus	Homedale WWTP	3 kg/day	5 kg/day	Permit # ID0020427

Table 17. State of Idaho water temperature criteria.

Temperature Criteria	Cold Water Aquatic Life (June 22-Sept 21)	Salmonid Spawning (March 1-June 15)
Instantaneous Maximum	22 °C., 71.6 °F.	13 °C., 55.4 °F.
Maximum Daily Average	19 °C., 66.2 °F.	9 °C., 48.2 °F.

*Water temperature criteria is applicable only to trout.

Table 18. Load allocations for streams requiring temperature TMDLs.

Stream Segment / Month	Existing shade as determined by SSTEMP (Riparian %)	Estimated system potential shade (Riparian %)	Shade to meet numeric temperature standards (Riparian %)	Temperature criteria -or- best achievable temperature (°C)	Decrease in current mean temperature (°C) to meet standard -or- best achievable temperature	Current solar load as per SSTEMP (j/m2/s)	Solar loading capacity (LC) based on shade to meet standard or best achievable temperature (j/m2/sec)	Solar load decrease (j/m2/s) to meet capacity (Load Allocation)	Required increase in shade (%)
North Fork Castle Creek	Insufficient Data to Develop TMDL								
Sinker Creek (July)	58.2	70.4*	70.4	19**	0.85	4.30	3.49	0.81	12[a]
Succor Creek – Headwaters to Berg Mine May June	16 14	55 55	55[b] 55[b]	9.52 10.67	0.90 1.22	109.88 183.80	50.61 115.26	59.27 68.54	39 41
Succor Creek – Berg Mine to Chipmunk Meadows May June	14 13	55 55	55[b] 55[b]	10.10 11.46	0.52 0.71	135.87 205.86	63.94 120.81	71.93 85.05	41 42
Chipmunk Meadows to Succor Creek Reservoir	Insufficient Data To Develop TMDL								
Succor Creek - Reservoir to the Oregon Line May June July August	14 13 13 14	55 55 55 55	55[b] 55[b] 24 53	9.63 10.76 22 22	0.66 0.87 0.20 1.61	124.57 202.35 208.78 87.59	57.37 122.03 184.88 43.34	67.20 80.32 23.90 44.25	41 42 11 39

Shaded Columns Represent Existing Conditions

IMPLEMENTATION PLAN PRIORITIES

Lower Succor Creek and Jump Creek subwatersheds would be the top priority for water quality improvement for several reasons. Although both these streams are 303 (d) listed for sediment, Lower Succor Creek is also listed for bacteria. The listed portions of both subwatersheds are primarily privately owned irrigated agricultural lands. The largest contributing factor to the sediment load in both Jump and Lower Succor creek is irrigation-induced erosion. There are many BMPs that have been and could be installed to reduce this irrigation induced erosion. There are also several BMPs that can be initiated along Lower Succor Creek that will address the bacteria problem.

Although Castle Creek is also listed for sediment, it would be a lower priority than both Lower Succor and Jump Creek as the sedimentation problem is not nearly as severe. Castle Creek is basically a lowland riparian area with a few agricultural fields on the uplands that drain into the creek. The primary emphasis is BMPs for the riparian area, although we also wanting to focus on installing BMPs on the agricultural fields that drain into the creek.

Sinker Creek would be next in priority. Although this stream is listed for both sediment and temperature, it is a mix of very limited irrigated agricultural lands, uplands and riparian. The last of the irrigated lands will have BMPs installed this year. These BMPs should greatly reduce any sediment loading from those agricultural fields. Sinker Creek is primarily used for livestock grazing with a reservoir above the Joyce Ranch and a reservoir near the bottom of the creek. Livestock grazing practices (BMPs) are being changed to reduce the impact that livestock have on the riparian area which should positively impact both sediment and temperature issues.

Upper Succor Creek is listed for both sediment and temperature. Except for one small irrigated pasture, Upper Succor Creek is primarily used for livestock grazing. Much of the riparian area is improving as many riparian BMPs have been initiated, but there are still several areas that need grazing BMPs installed in the future.

**** For a more detailed description of each subwatershed and their implementation plans, please see Appendix #1 for Castle Creek, Appendix #2 for Jump Creek, Appendix #3 for Sinker Creek and Appendix #4 for Upper and Lower Succor Creek.**

RECOMMENDED CONSERVATION PLAN ELEMENTS

Conservation plans will be developed by ISCC & IASCD in conjunction with NRCS and the local Soil Conservation Districts (Bruneau River Soil Conservation District and/or Owyhee Soil Conservation District).

The nine step NRCS planning criteria will be used to ensure quality design and installation of applicable BMPs. All Endangered Species Act (ESA), Cultural Resources, permit & easement issues will be addressed during the conservation planning process. Conservation plans will be developed with landowners to establish BMPs that will improve and maintain healthy riparian conditions. High priority areas for conservation planning are determined by the stream's current "state of transition" and how effectively a BMP will improve conditions. What works well on one specific stream reach may not work at all in another.

The first three elements that follow are focused on improving and maintaining multiple resources within the riparian areas on privately owned parcels. If properly implemented, these efforts by individual landowners will increase channel stability and shading within the stream segments with TMDL allocation targets. Although there are well-shaded and stable stream reaches with narrow channel widths, good soil, and adequate water supply within the watershed, they are considered rare exceptions. Regardless of TMDL shade targets, riparian stability and species diversity need to be improved by adjusting grazing management strategies on private lands.

The fourth element on the list deals directly with BMPs on irrigated cropland. Intensive farming can accelerate sediment problems in nearby streams, causing water quality problems. Irrigation BMPs can be installed to reduce and even eliminate irrigation- induced erosion that cause sediment problems in water quality impaired streams.

Element #1 - Grazing management components should be included in every Conservation Plan if applicable.

Properly implemented grazing plans are intended to improve and maintain upland and riparian plant vigor while meeting many of the local resource needs. For riparian plants, increasing bank stability through an increased quantity of stabilizing plants is a high priority. With the exception of bedrock and boulder channel types, channel shape conversion from "dish" to "trapezoid" and "inverse trapezoid" will follow with an increase of bank stability. Where woody vegetative species (primarily shrubs) are capable of reproducing along riparian areas, shading will also increase naturally. Where stream floodplains are wide, stream gradient very low, and silt/clay soils are dominant, shrub species will be limited. Channel shape and over hanging banks will provide the best conditions for maintaining water temperatures in these types of conditions. Temperatures in east/west stream channels will likely differ from north/south flowing streams because of shading effectiveness.

Element #2 - New or additional watering sources for livestock and wildlife use may be needed to reduce grazing intensity on riparian vegetation.

By developing watering sources away from streams, grazing intensity on the riparian area is reduced. Riparian fencing may not be necessary or feasible in many of the remote areas of Owyhee County. If riparian fencing is installed along stream channels, water gaps can be installed for livestock watering with minimal impact to water quality and riparian function.

Element #3 - Existing large pastures may need to be divided into smaller pastures to create an effective grazing rotational system that controls both duration and timing of livestock use.

While fencing of specific riparian areas may be recommended, early season grazing of riparian areas can occur if duration is short and ample time is allowed for regrowth. This type of management will ensure healthy root growth of riparian species for the entire season. Fall grazing can occur if livestock do not overly desire protein during this period of time. Protein availability in grasses late in the growing season is very low, while shrub protein is high. Livestock supplements such as protein blocks may overcome excessive utilization of shrubs (willows, dogwood, etc.) in the summer and fall months.

Element #4 – Irrigated Cropland should use Nutrient, Pest, Residue and Irrigation Management along with other BMPs in their operation to reduce irrigation-induced erosion.

There are several Best Management Practices that can be used in irrigated cropland which will effectively reduce, or eliminate irrigation-induced erosion, thus reducing sediment loading to nearby streams. These practices include Sediment Basins, Filter Strips, Surge Irrigation, PAM, Conservation Crop Rotation, Deep Tillage, Irrigation Land Leveling, Irrigation System, Irrigation Water Management, Nutrient Management, Pest Management and Residue Management. Your local NRCS, Soil Conservation District, ISCC and IASCD are your best sources of information about which BMPs will work best in a given situation on irrigated cropland. The Implementation Tiers evaluation listed below will be used to rate irrigated cropland priorities.

IMPLEMENTATION TIERS

In order to achieve the goals set forth in the TMDL Subbasin Assessment, land treatment through BMP installation will be pursued in a three tier format. Agricultural land that drains directly into a 303 (d) listed stream is included in **Tier 1**. Tier 1 fields have the most immediate impact on water quality due to their proximity, or influence to a 303 (d) listed stream segment. Unlike Tier 1 fields,

Tier 2 fields are not directly adjacent to a 303 (d) listed stream segment, and the wastewater from Tier 2 acreage has the potential to be reused by Tier 1 acreage before entering a 303 (d) listed stream segment. **Tier 3** fields are located in the uplands where wastewater has the potential to be used multiple times by Tier 2 and Tier 1 acreage before entering a stream segment of concern.

In terms of BMP implementation Tier 1 Fields are high priority, Tier 2 Fields are medium priority, and Tier 3 Fields are low priority in terms of water quality.

These tiers only apply to surface irrigated cropland fields and do not include sprinkler irrigated agricultural land, pastureland, or CAFO/AFO units within the Jump Creek and Lower Succor Creek Sub-watersheds.

The Jump Creek and Lower Succor Creek Sub-watersheds consist of a total of 32,296.0 acres, but only 25,681.9 acres (79.5%) actually produce agricultural crops. Table l below shows the total farmable acres in each of their respective categories.

Table 19. Jump Creek and Lower Succor Creek Sub-watersheds

Treatment Unit	**Acres**	**Percentage of total ag. acres**
Tier 1: surface irrigated cropland	963.4	3.8%
Tier 2: surface irrigated cropland	7401.8	28.8%
Tier 3: surface irrigated cropland	8117.5	31.6%
Irrigated Pasture	1815.9	7.1%
Sprinkler irrigated cropland	7083.7	27.6%
CAFO/AFO	299.6	1.1%
Total	25681.9	100%

Please refer to figure 1.3 for tier field locations within Jump Creek and Lower Succor Creek Sub-watersheds.

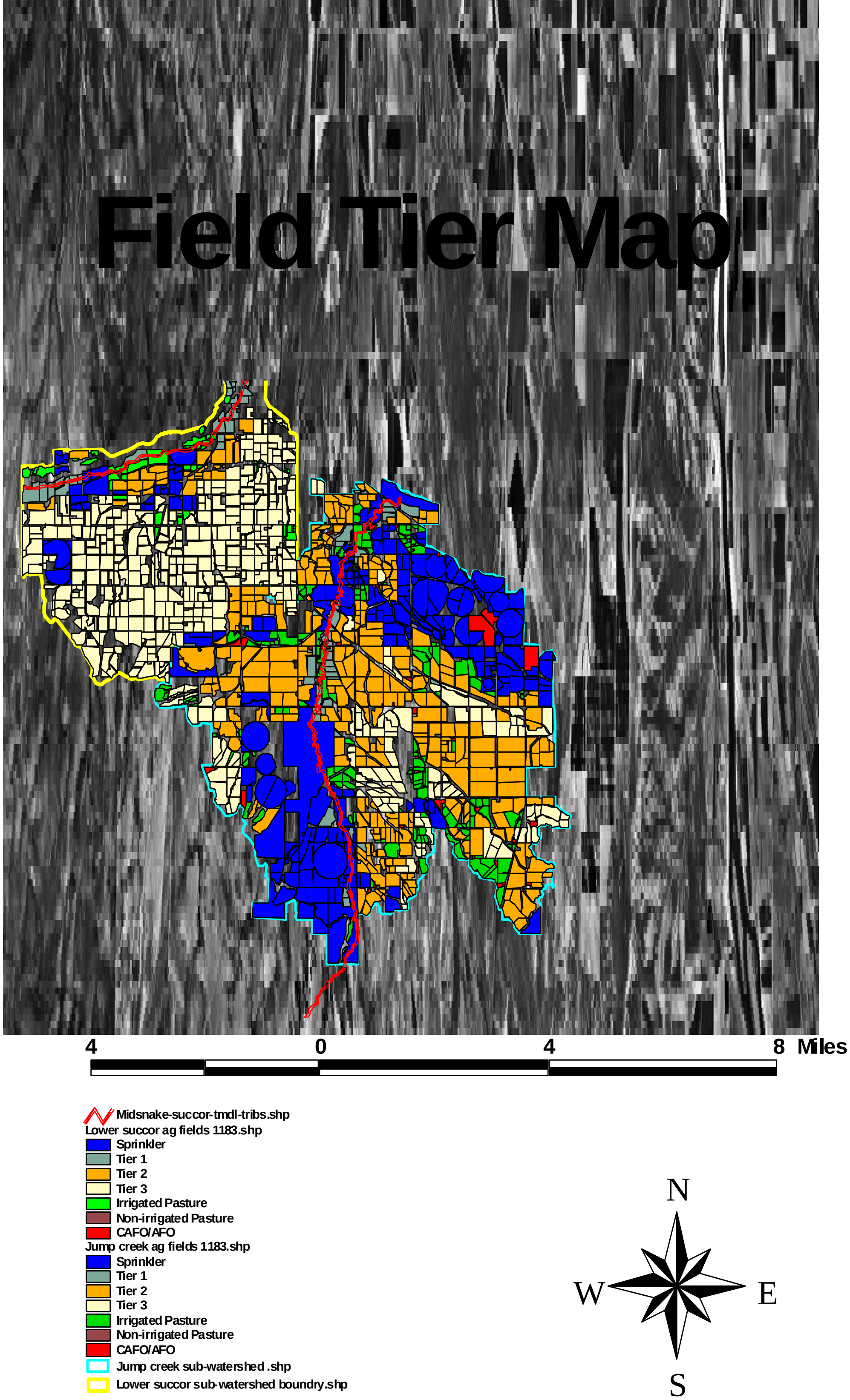


Figure 1.3 Tier Map - Jump Creek and Lower Succor Creek Sub-watersheds

BMP IMPLEMENTATION ALTERNATIVES AND COSTS

The cost list to install BMPs on private agricultural land is available from the Owyhee Soil Conservation District office in Marsing and the Bruneau River Soil Conservation District office in Bruneau. These costs have been developed through actual tracking of average BMP installation costs and are used county-wide to determine allowed contracted costs through the USDA Environmental Quality Incentives Program (EQIP). When there is a large distance between material suppliers and the location of installation, there is a greater overall cost for the BMP as a result of the cost for delivery. Where shallow soils exist, fence building materials (as well as installation costs) may differ greatly from typical costs. Since actual costs to install a BMP may not be known until during (or after) installation, a more accurate watershed-wide budget will be developed during the on-site planning and implementation process. Table 21 on the following page, provides the typical costs for many of the applicable BMP components for southern Idaho. Labor and equipment costs are not included in this table due to the variation from one site to another.

Table 20. Average Costs of Component Practices Applicable to Owyhee County

Component Practice	Unit of Measure	Cost/Unit
Fence, 4 wire	Feet	$ 1.40
Fence, 5 wire	Feet	$ 1.75
Fence, wood, panel & pole	Feet	$ 2.50
Filter Strip	Acre	$ 200.00
Prescribed Grazing, Irrigated pasture	Acre	$ 1.10
Irrigation Systems, Sprinkler (Center Pivot)	Acre	$ 1320.00
Irrigation Systems, Sprinkler (Wheel Line)	Acre	$ 1125.00
Prescribed Grazing, Rangelane	Acre	$ 0.11
Prescribed Grazing, Woodland	Acre	$ 0.11
Grazing Land Mechanical Treatment	Acre	$ 28.00
Range Planting	Acre	$ 132.00
Spring Development	Each	$2,000.00
Trough or Tank	Each	$ 990.00
Streambank & Shoreline Protection	Each	Job Estimate
Stream Channel Stabilization	Each	Job Estimate
Watering Facility, Large Storage Tank	Each	Job Estimate
Watering Facility, Nose pump	Each	$ 550.00
Watering Facility, Trough or Tank	Each	$ 990.00

Costs may increase with greater travel distances and accessibility
****Source: NRCS 2005 EQIP Cost List – Average Costs, For Estimates Only**

Example Description of Alternatives for Surface Irrigated Cropland (Prices based on the NRCS 2005 Cost List, plus 15% for increased cost of materials)

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

SITE SPECIFIC BMP Alternative #1a ($1520/acre)	SITE SPECIFIC BMP Alternative #2 (575/acre)	SITE SPECIFIC BMP Alternative #3 $300/acre)
Irrigation Water Mgmt.	Irrigation Water Mgmt.	Irrigation Water Mgmt.
Drip Irrigation System	Land Leveling	Concrete Ditch
Nutrient Mgmt.	Surface Irrigated System	Filter Strip
Conservation Crop Rotation	Gated Pipe	PAM
Alternative #1b	Tail Water Recovery System	Sediment Basin
($920/acre)	Nutrient Mgmt.	Nutrient Mgmt.
Sprinkler Irrigation	Conservation Crop Rotation	Conservation Crop Rotation
Nutrient Mgmt.	Conservation Tillage	Conservation Tillage
Conservation Crop Rotation		
Irrigation Water Mgmt.		

Example Description of Alternatives for Surface Irrigated Pasture (Prices based on the NRCS 2005 Cost List plus, 15% for increased cost of materials)

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

SITE SPECIFIC BMP Alternative #1 ($520/acre)	SITE SPECIFIC BMP Alternative #2 ($400/acre)	SITE SPECIFIC BMP Alternative #3 ($290/acre)
Fencing	Fencing	Fencing
Planned Grazing System	Planned Grazing System	Pasture & Hayland Mgmt.
Pasture & Hayland Mgmt.	Pasture & Hayland Mgmt.	Nutrient Mgmt.
Nutrient Mgmt.	Nutrient Mgmt.	Livestock Watering Fac.
Heavy Use Protection	Irrigation Water Mgmt.	Irrigation Water Mgmt.
Livestock Watering Fac.	Livestock Watering Fac.	Field Border Irr. System
Irrigation Water Mgmt	Field Border Irr. System	
Field Border Irr. System		
Gated Pipe		

INSTALLATION AND FINANCING

Landowners can enter into voluntary water quality contracts with the local Soil Conservation District (SCD) to reduce out of pocket expenses to implement BMPs. The USDA Natural Resources Conservation Service (NRCS), Idaho Soil Conservation Commission (ISCC), and Idaho Association of Soil Conservation Districts (IASCD) are technical agencies that can assist landowners in conservation plan development, BMP design, and identification of funding sources. Each landowner participating in an SCD sponsored program is responsible for installing the BMPs scheduled within their water quality contract (plan of operations). Each participant is also required to make their own arrangements for financing their share of installation costs. Available funding sources for BMP installation are listed in Appendix 5.

Table 21. Estimated BMP Cost Summary of Treatment Alternatives for Jump & Lower Succor Creek Sub-watersheds, Tier 1 Fields.

ALTERNATIVE		ACRES	Total Costs
Alternative 1a	$1520 / AC	963.4	$1,464,400
Alternative 1b	$ 920 / AC	963.4	$ 886,300
Alternative 2	$ 575 / AC	963.4	$ 554,000
Alternative 3	$ 300 / AC	963.4	$ 289,000

Table 22. Estimated BMP Cost Summary of Treatment Alternatives for Jump & Lower Succor Creek Sub-watersheds, Tier 1 & Tier 2 Fields.

ALTERNATIVE		ACRES	Total Costs
Alternative 1a	$1520 / AC	8365	$ 12,714,800
Alternative 1b	$ 920 / AC	8365	$ 7,695,800
Alternative 2	$ 575 / AC	8365	$ 4,809,900
Alternative 3	$ 300 / AC	8365	$ 2,509,500

OPERATION, MAINTENANCE AND REPLACEMENT

Participants of SCD sponsored programs are required to maintain the BMPs throughout its expected life span. The program contract outlines the landowner's responsibilities regarding operation and maintenance (O&M) for each BMP.

Inspections of installed BMPs are made annually by available technicians within the local SCD, NRCS, IASCD, or ISCC during the contracted period of the water quality/conservation plan. It is intended that the contracted BMPs will become a part of the participant's farming or ranching operation and will continue to be maintained after the water quality contract expires.

MONITORING AND EVALUATION

Component practice BMP evaluation is done in conjunction with conservation plan and program contract implementation. The objective of an individual conservation plan evaluation is to verify that BMPs are properly installed, maintained, and working as designed. An October 2003 publication by ISCC and IDEQ entitled *Idaho Agricultural Best Management Practices: " A Field Guide for Evaluating BMP Effectiveness"* provides the specifications and protocol for BMP evaluation to be used by field staff. Monitoring for pollutant reductions from individual projects consists of spot checks, annual reviews, and evaluation of advancement toward reduction goals. The results of these evaluations are used to recommend any necessary adjustments to continue meeting resource objectives. Annual status reviews are typically done within program contracts to ensure compliance with contract rules.

Where conservation plans are developed in cooperation with a local Soil Conservation District (SCD), progress is tracked during the life of a program contract. Local tracking is assisted by NRCS and ISCC agency program specialists, where cost-share programs/projects are active. Where cost-share programs are not used, tracking is up to the local SCD or NRCS field offices.

Additionally, "reference reach" transects will be established on multiple stream segments within the watershed to determine potential and capability for shading of stream channels. Once BMPs are established on other stream reaches, tracking of progress toward "reference reach" status will be monitored and evaluated. Adjustments to implementation strategies will be adjusted as necessary to maximize effectiveness of implemented BMPs.

GLOSSARY OF TERMS AND ACRONYMS

Aquifer - A water-bearing bed or stratum of permeable rock, sand, or gravel capable of yielding considerable quantities of water to wells or springs.

Antidegradation - A Federal regulation requiring the States to protect high quality waters. Water Quality Standards may be lowered to allow important social or economic development only after adequate public participation. In all instances, the existing beneficial uses must be maintained.

Aquatic - Growing, living, or frequenting water.

Assimilative Capacity - An estimate of the amount of pollutants that can be discharged to a water body and still meet the state water quality standards. It is the equivalent of the Loading Capacity, which is the equivalent of the TMDL for the water body.

Bedload - Sand, silt, gravel, or soil and rock detritus carried by a stream on or immediately above (3") its bed.

Beneficial Use - Any of the various uses which may be made of the water of an area, including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics.

Best Management Practice (BMP) - A measure determined to be the most effective, practical means of preventing or reducing pollution inputs from point or nonpoint sources in order to achieve water quality goals.

Biomass - The weight of biological matter. Standing crop is the amount of biomass (e.g., fish or algae) in a body of water at a given time. Often measured in terms of grams per square meter of surface.

Biota - All plant and animal species occurring in a specified area.

Coliform bacteria - A group of bacteria predominantly inhabiting the intestines of man and animal but also found in soil. While harmless themselves, coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms.

Critical Areas - Areas identified by the commission based on recommendations from local entities producing significant nonpoint source pollution impacts or areas deemed necessary for protection or improvement for the attainment or support of beneficial uses.

Designated Beneficial Use or Designated Use - Those beneficial uses assigned to identified waters in Idaho Department of Health and Welfare Rules, Title 1, Chapter 2, "Water Quality Standards and Wastewater Treatment Requirements”:, Sections 110. through 160. and 299., whether or not the uses are being attained.

Erosion - The wearing away of areas of the earth's surface by water, wind, ice, and other forces.

Existing Beneficial Use or Existing Use - Those beneficial uses actually attained in waters on or after November 28, 1975, whether or not they are designated for those waters in Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58).

Exotic Species - Non-native or introduced species.

Feedback Loop - A component of a watershed management plan strategy that provides for accountability on targeted watershed goals.

Flow - The water that passes a given point in some time increment.

Groundwater - Water found beneath the soil's surface; saturates the stratum at which it is located; often connected to surface water.

Habitat - A specific type of place that is occupied by an organism, a population or a community.

Headwater - The origin or beginning of a stream.

Hydrologic basin - The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area. There are six basins described in the Nutrient Management Act (NMA) for Idaho -- Panhandle, Clearwater, Salmon, Southwest, Upper Snake, and the Bear Basins.

Hydrologic cycle - The circular flow or cycling of water from the atmosphere to the earth (precipitation) and back to the atmosphere (evaporation and plant transpiration). Runoff, surface water, groundwater, and water infiltrated in soils are all part of the hydrologic cycle.

Intermittent Waters – A stream, reach, or waterbody which has a period of zero (0) flow for at least one (1) week during most years. Where flow records are available, a stream with a 7Q2 hydrologically-based flow of less than one-tenth (0.1) cfs is considered intermittent. Streams with natural perennial pools containing significant aquatic life uses are not intermittent.

Irrigation Water Management (IWM) - IWM involves providing the correct amount of water at the right times to optimize crop yields, while at the same time protecting the environment from excess surface runoff. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency as well as irrigation scheduling and soil moisture-monitoring methods.

LA - Load Allocation for nonpoint sources.

Limiting - A chemical or physical condition that determines the growth potential of an organism, can result in less than maximum or complete inhibition of growth, typically results in less than maximum growth rates.

Load Allocation - The amount of pollutant that nonpoint sources can release to a water body.

Loading - The quantity of a substance entering a receiving stream, usually expressed in pounds (kilograms) per day or tons per month. Loading is calculated from flow (discharge) and concentration.

Loading Capacity - A mechanism for determining how much pollutant a water body can safely assimilate without violating state water quality standards. It is also the equivalent of a TMDL.

Macro invertebrates - Aquatic insects, worms, clams, snails, and other animals visible without aid of a microscope, that may be associated with or live on substrates such as sediments and macrophytes. They supply a major portion of fish diets and consume detritus and algae.

Macrophytes - Rooted and floating aquatic plants, commonly referred to as water weeds. These plants may flower and bear seed. Some forms, such as duckweed and coontail (*Ceratophyllum*), are free-floating forms without roots in the sediment.

Margin of safety (MOS) - An implicit or explicit component of water quality modeling that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving water body. This accounts for any lack of knowledge concerning the relationship between pollutant loads and the water quality of the receiving water body. It is a required component of a TMDL and is normally incorporated into the conservative assumptions used to develop the TMDL (generally within the calculations or models) and is approved by the EPA either individually or in State/EPA agreements. Thus, the TMDL = LC = WLA + LA + MOS.

National Pollution Discharge Elimination System (NPDES) - A national program from the Clean Water Act for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcement permits, and imposing and enforcing pretreatment requirements.

Nonpoint Source - A geographical area on which pollutants are deposited or dissolved or suspended in water applied to or incident on that area, the resultant mixture being discharged into the waters of the state. Nonpoint source activities include, but are not limited to irrigated and nonirrigated lands used for grazing, crop production and silviculture; log storage or rafting; construction sites; recreation sites; and septic tank disposal fields.

Participant - Individual agricultural owner, operator, partnership, private corporation, conservation district, irrigation district, canal company, or other agricultural or grazing interest approved by the commission for cost-sharing in an eligible project area; or an individual agriculture owner or operator, partnership, or private corporation approved by a project sponsor in an eligible project area.

Project Sponsor - A conservation district, irrigation district, canal company or other agriculture or grazing interest as determined appropriate by the commission that enters into a water quality project agreement with the commission.

Reach - A continuous unbroken stretch of river.

Riparian vegetation - Vegetation that is associated with aquatic (streams, rivers, lakes) habitats.

Runoff - The portion of rainfall, melted snow, or irrigation water that flows across the surface or through underground zones and eventually runs into streams.

Sediment - Bottom material in a body of water that has been deposited after the formation of the basin. It originates from remains of aquatic organism, chemical precipitation of dissolved minerals, and erosion of surrounding lands.

Sub-watershed - Smaller geographic management areas within a watershed delineated for purposes of addressing site specific situations.

Threatened species - A species, determined by the U.S. Fish and Wildlife Service, which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

TMDL - Total Maximum Daily Load. TMDL = LA + WLA + MOS. A TMDL is the equivalent of the Loading Capacity which is the equivalent of the assimilative capacity of a water body.

Total Suspended Solids (TSS) - The material retained on a 45 micron filter after filtration

Tributary - A stream feeding into a larger stream or lake.

Waste Load Allocation - The portion of receiving water's loading capacity that is allocated to one of its existing or further point sources of pollution. It specifies how much pollutant each point source can release to a water body.

Water Pollution - Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to fish and wildlife, or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.

Water Quality Contract - The legal document executed by the commission or the project sponsor identifying terms and conditions between the commission or the project sponsor and an individual cost-share participant.

Water Quality Management Plan - A state- or area-wide waste treatment plan developed and updated in accordance with the provisions of the Clean Water Act.

Water Quality Limited Segment (WQLS) - Any segment where it is known that water quality does not meet applicable water quality standards and/or is not expected to meet applicable water quality standards.

Water Quality Plan - The plan developed cooperatively by the participant, technical agency and the commission or project sponsor which identifies the critical areas and nonpoint sources of water pollution on the participant's operation and sets forth BMPs that may reduce water quality pollution from these critical areas and sources.

Water table - The upper surface of groundwater; below this point, the soil is saturated with water.

Watershed - A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation. The whole geographic region contributing to a water body.

WLA - Wasteload Allocation for point sources.

Useful Conversion Factors

1 meter = 3.821 feet 1 hectare = 0.4047 acre $^{o}C = (^{o}F - 32)/1.8$